PLEASE READ THIS PAGE!!

1. **Hints:**
   - You might want to quickly look over all of the questions and start by working the questions that are easiest for you.
   - Check your answers only if you have time.
   - Many of the questions have multiple parts. Don’t automatically give up on a question because you don’t know how to do one part.
   - Consider showing your work, even when it’s not requested. This could help you earn partial credit for an incorrect answer.
   - You don’t get extra points for finishing early. If you have extra time, please consider checking your work over one more time before turning in your paper.

2. **Reminders:**
   - No calculators, cell phones, PDAs, or any other electronic devices are allowed.
   - You are allowed to use the sheet of notes that you prepared for use with this exam (one side of one 8\(\frac{1}{2}\)'' × 11'' sheet of paper with handwritten notes). No other type of written materials is allowed.

3. Read the following statement and sign your name:

   *On my honor, as a student, I have neither given nor received unauthorized aid on this academic work.*

   Signature: ______________________________________________________

4. Please make sure that your exam contains seven pages, including this one.

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1. (3 points each) Circle either “True” or “False” for each of the following:

a) True False: Let $a$ and $b$ be non-zero whole numbers. Then $a^n \times b^n = (a \times b)^n$ for all whole numbers $n$.

b) True False: $(9 \times 6) - (5 \times 6) = (9 - 5) \times 6$ is an example of the distributive property of multiplication over subtraction.

c) True False: 8 does not divide 139,738,456.

d) True False: \(\frac{3^5}{2^2 \times 3^3 \times 13 \times 5^{16}}\) has a terminating decimal representation.

e) True False: Every set that is closed under multiplication must also be closed under addition.

f) True False: Let $n$ and $m$ be whole numbers with $\text{LCM}(n, m) = 15$ and $\text{GCF}(n, m) = 5$. Then $n \times m = 75$.

g) True False: If you were to use the prime factor test to check whether 129,411 were prime, you would only need to check whether 129,411 were divisible by primes no bigger than $\sqrt{129,411}$.

h) True False: $3 + \frac{5}{2} \div \frac{1}{2} \times 4 = 23$.

2. (5 points) Fill in the blanks (do not abbreviate!):

\(\frac{5}{6} + \frac{3}{4} = \frac{3}{4} + \frac{5}{6}\) is an example of the __________ property for the addition of fractions. We can think of this property as an extension of the same property for whole number addition. We will do this by rewriting both fractions using a common denominator. We can find the lowest common denominator by looking at the __________ common __________ of six and four. Rewriting our fractions with our common denominator, we have:

\[
\frac{5}{6} = \frac{\phantom{12}}{12} \\
\frac{3}{4} = \frac{9}{12}
\]

We can then think of our fraction addition problem as a whole number addition problem where we are counting pieces of size $\frac{1}{12}$. We then use the corresponding property of whole number addition to get:

\[
\phantom{\text{sit}} + 9 = \phantom{\text{sit}} + \phantom{\text{sit}}
\]

Thus, \(\frac{5}{12} + \frac{9}{12} = \phantom{\text{sit}} + \phantom{\text{sit}}\). Rewriting in simplest form, we have $\frac{5}{6} + \frac{3}{4} = \frac{3}{4} + \frac{5}{6}$.
3. Terry’s class has 24 students. The baseball fans are fans of exactly one team. There are 4 Cub fans, 1 A’s fan, 3 Cardinals fans, and 8 Royals fans. The rest of the class isn’t interested in baseball.

(a) (2 points) What fraction of Terry’s class consists of Royals fans? Express your answer in simplest form.

(b) (2 points) Express your answer from (a) as a decimal.

(c) (4 points) What is the percentage of Cardinals fans in Terry’s class?

(d) (4 points) What is the ratio of baseball fans to non-fans in Terry’s class?

4. (4 points each) Calculate the following. If your answer is a fraction, please write it in simplest form. This is not a mental math problem! Show your work in an easy to follow manner.

a) \( \frac{9}{15} \div \frac{3}{5} = \)

b) \( \frac{5}{16} \times \frac{8}{15} = \)
c) \(1.296 + 32.01 = \)

d) \(\frac{1\frac{1}{4}}{\frac{5}{3}} = \)

e) \(\text{GCF}(1034, 514) = \)

5. (4 points) Express \(2.30\overline{7} \) as a fraction. You do not need to simplify your answer.

6. (4 points) Write a short story problem which can be solved by \(\frac{3}{5} \div \frac{1}{15}\).
7. (4 points) Explain how decomposition and regrouping are used in the following arithmetic problem:

8. Consider

a) (2 points) Use estimation to show that the answer given is incorrect.

b) (4 points) Show how to do the problem using the standard algorithm.

c) (3 points) Explain how to place the decimal point. In particular, why did your procedure give the correct answer?
9. We can factor 18 in two ways as a product of single digit numbers (up to the order of the factors); namely, $2 \times 9$ or $3 \times 6$.

   a) (2 points) Using divisibility tests for single digit numbers, state a test for divisibility by 18.

   b) (3 points) Would using the other pair of two single digit factors give a valid divisibility test for 18? Explain.

   c) (3 points) Apply your test to check whether 18 divides 29,715,312. Show your work. Do not divide 29,715,312 by your single digit factors.
10. (10 points) Toby and Terry have invited you over for dinner at their new house. You have been promised your favorite beverage if you can figure out their new street address from the following clues:

(a) The address is 2____9____ Perth Avenue.

(b) The last house number on Perth Avenue is 2650.

(c) Terry’s birthday is 5/9. Both the month and the day of Terry’s birth divide the house number.

What is their street address? Is there more than one possibility? Explain.